Abstract

Over the past decade, the explosive growth of the Internet has led to a surge of interest to understand and predict aggregate behavior of large number of people or agents, particularly when they are connected through an underlying network structure. Numerous Internet-based applications have emerged that are as diverse as getting micro-tasks executed through online labor markets (also known as crowdsourcing) to acquiring new skills through massively open online courses (also known as MOOCs). However, there has been a major inadequacy in existing studies with respect to evaluating the impact of strategic behavior of the agents participating in such networks, crowds, and classrooms. The primary focus of this doctoral work is to understand the *equilibrium behaviour* emerging from these real-world, strategic environments by blending ideas from the areas of game theory, graph theory, and optimization, to derive novel solutions to these new-age economic models. In particular, we investigate the following three research challenges:

(1) How do strategic agents form connections with one another? Will it ever happen that strategically stable networks are social welfare maximizing as well?

(2) How do we design mechanisms for eliciting truthful feedback about an object (perhaps a new product or service or person) from a crowd of strategic raters? What can we tell about these mechanisms when the raters are connected through a social network?

(3) How do we incentivize better participation of instructors and students in online education forums? Can we recommend optimal strategies to students and instructors to get the best out of these forums?